

EFFECTS OF BOTULINUM TOXIN ON GAIT IN CHILDREN WITH CEREBRAL PALSY: A SYSTEMATIC REVIEW

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ABSTRACT

Background: Cerebral palsy (CP) is the most common cause of chronic motor disability in childhood. Children with CP often demonstrate various types of abnormal muscle tone, with spastic CP being the most common presentation. Spasticity and the resulting decrease in joint range of motion of lower extremities could lead to gait difficulties in this patient population. Previous research has shown that botulinum toxin (BTX) can decrease muscle spasticity and improve joint range of motion. However, it remains unclear whether BTX improves ambulation capacity in children with CP.

Objective: The purpose of this systematic review (SR) was to evaluate the effects of BTX on gait in children with CP.

Methods: PubMed and Embase were searched on November 18, 2021 for randomized controlled trials or quasi-experimental studies with control that investigated the effectiveness of BTX on gait in children with CP. Only studies published since 2011 were included in the current review. Risk of bias of the included studies was assessed with PEDro.

Results: Seven studies with a total number of 367 individuals with spastic CP were included in this SR. The control group received conventional physical therapy, while the interventional group received single dose of BTX injection in one of the lower extremity muscle groups in addition to conventional physical therapy. Our findings revealed BTX improved gait parameters at 4-12 weeks following injection as compared to the control group ($p < 0.05$) in 6 out of 7 studies. However, one study showed BTX did not add to the clinical effectiveness of rehabilitation as compared to control ($p > 0.05$). Side effects including local muscle weakness were noted in a small portion of participants. The average PEDro score is 7.7/10, indicating good quality of the included studies.

Conclusion: BTX could potentially improve ambulation capacity in children with CP.

Keywords: cerebral palsy, botulinum toxin, gait, ambulation.

INTRODUCTION

Cerebral palsy (CP) describes a group of permanent disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain [1]. It is the most common cause of chronic motor disability in childhood [2]. CP could present with various types of abnormal muscle tone including spasticity, athetosis, ataxia, or hypotonia. Spasticity is the most common tonal presentation, which is observed in 87.4% of children with CP [3]. Spasticity and the resulting decrease in joint range of motion of lower extremities (LEs) are important contributing factors to gait difficulties in patients with CP. The involved individuals constantly face ongoing challenges with difficulties in ambulation, which is evidenced by abnormal gait pattern, decreased gait speed, decreased endurance, and increased fall risk [3].

Botulinum toxin (BTX) intramuscular injection is a rather innovative way to control skeletal muscle spasticity. By inhibiting the acetylcholine release at the neuromuscular junction, BTX has been successfully used to decrease muscle spasticity caused by stroke, traumatic brain injury, and spinal cord injury [4]. Ever since the use of BTX in managing spasticity associated with CP in 1990s [5], most of the